

referring to the instructive details of the present volume, but in the meantime we shall merely quote the author's outstanding observations on the purposes of the volume preceding, and his general advice to the assistant engineer on the setting out of cuttings and embankments, viaducts, and bridges, &c.

"In the first part of the 'Assistant Engineer's Railway Guide' the principally intended purpose was to give instructions to the uninitiated with regard to the methods most usually employed by practical men to ascertain by 'boring,' the nature of sub-soils, stratification, foundations, &c.; to set out the tangents and curves of the permanent centre line of an intended railway; to take the levels of the working section, the art of levelling being supposed known to the reader; and to set out the widths required for the slopes of excavations and embankments. On these subjects we will simply repeat at present, that in taking the levels, particularly over a rough country, the permanent posts, which are to be referred to as so many bench marks, should not be more than 10 or 12 chains apart; that there should be one at each end of every cutting, near every road to be crossed, at both ends of all viaducts and tunnels; that they should be well secured from mischief, and at sufficient distance from the foundations, so that they need not be interfered with by excavating; and if these works are to be of any magnitude, there should be sufficient intermediate posts. As the levels of these important constructions will be obtained from these posts, too much care cannot be bestowed in obtaining their real height as referred to datum. Let me persuade the young practitioner, that the gratification he will feel at finding the string courses of his bridges and viaducts at their true height and gradient, the formation of a tunnel at the intended levels, will alone amply reward him for his trouble, independently of a reputation for accuracy, which he will not fail to obtain in the opinion of a judicious chief, as also in the estimation of directors. Let him beware of the vaunts of 'rough-and-ready men' (rough work and readiness to blunder), who disguise their incapacity and ignorance by pleading the impossibility in practice to obtain truly correct levels; for if there be any truth, rationally speaking, in this excuse, the greater should be the engineer's care to avoid errors, and not to do his work in a slovenly manner, whereby he may double and treble his 'mistake,' and he will find that contractors, masons, bricklayers, &c., will be careful and attentive exactly in proportion to the care and attention which he himself bestows on the works. This observation applies exactly in the same sense, and to the same extent in setting out works. He will, moreover, have the satisfaction of knowing, that his mind on this subject will be at ease as the works proceed, and that no reproach can be made to him: on the contrary, an error of this kind carried out can be considered little better than wilful neglect of duty.

The levelling book of the working section, with a correct sketch of the ground, or a pocket section, is constantly required on the works."

The pocket section being prepared, we should, as soon as the works of construction are determined on, insert notes from the working drawings or otherwise, of the angles of skew at which the line crosses roads, canals, &c., the spans of arches on the square and skew, the rise of the arch, the depth of arch stones, of puddle, if any; also, if the works be on an inclined plane, the rise or fall from centre to centre of piers: memoranda also, of nearly similar nature, should be made of girder bridges, culverts, drains, and other works occurring along the line. These remarks are more than necessary, because, when on the works, the drawings, when required, are often mislaid, or partially defaced or destroyed. It must be added, however reluctantly, that the tracings with which contractors and sub-contractors are supplied, are often wrongly figured, and the site of construction, amidst the moving to and fro of masons, labourers, and 'navvies,' is not the place where such errors may be most readily detected and corrected. The acting engineer always affixes his signature to the working drawing, but not always to the tracings, the correctness of which is often entrusted to a

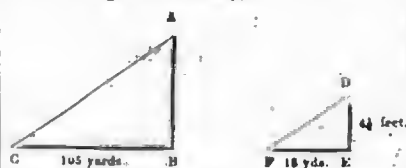
confidential office assistant, but who, from want of field practice, is not always aware of the value of correct figures. The 'Assistant engineer' will find it advantageous, and only consistent with his duty, to compare the copy of contract works with the office original. Whilst on this subject it may be as well to mention, that the advice and hints thrown out in these pages are for the guidance or consideration of the 'assistant engineer' who may also, to a certain extent, have to perform the duties of contractor's agent, which will always be the case when the works of a line are subdivided into numerous small contracts, a circumstance now of no rare occurrence; and in this case the engineer will find his duties and responsibilities doubly onerous. Reference to the extracts made from a pocket section will explain, fully it is hoped, the nature of the remarks required with regard to the contract works: their practical application will be more fully explained in the course of the following pages."

The little treatise on arithmetic, by the Rev. Mr. Calder, as its title-page also fully enough denotes, is a sort of novelty in figures, a rationale of arithmetic, and a handmaiden to young algebra. It is designed to supply a desideratum which teachers have wished for and pupils have required, namely, a school-book which would explain the more difficult parts of arithmetic in a manner sufficiently familiar for the comprehension of youth, and yet sufficiently accurate and attentive to principles to be worthy of being considered an explanation.

To any thing like a test of success in an undertaking of this sort, the pupil himself will be an indispensable requisite; but even without such a test we think it is obvious that much of the matter is extremely well adapted to the more advanced but still youthful arithmetical pupil and even to the incipient algebraist.

The following extract may serve to illustrate the author's style of explanation, while it gives a piece of useful information.

"The shadow of a steeple is 105 yards long, and that of a stick 4½ feet long is 15 yards: find the height of the steeple."



Let AB, BC, represent the steeple and its shadow, and let DE, EF, represent the stick and its shadow: I have to find the length of AB.

Now most pupils, seeing this question under the head of 'Rule of Three,' would immediately take it for granted that the three terms given would form a statement; i. e., that the ratio between the lengths of the two shadows is equal to that of the steeple and stick by which those shadows are cast. This is quite true; and my object in explaining this sum is merely to shew what authority we have for believing that these two ratios are equal. Join AC, DF, —these lines AC, DF, will represent the direction of rays of light from the sun, and being from the same distant body are considered parallel; hence, since AB, DE are parallel, as are also FE, CB; the triangles, ABC, DEF, are said to be similar: and from a geometrical property of such triangles, we have the following:

$$EF : BC :: DE : AB;$$

or, substituting the value of EF, BC, DE, which are given by the question, we have

$$15 \text{ yards} : 105 \text{ yards} :: 4\frac{1}{2} \text{ feet} : AB;$$

and therefore,

$$AB = \frac{105 \text{ yards} \times 4\frac{1}{2} \text{ feet}}{15 \text{ yards}} = 31\frac{1}{2} \text{ feet.}$$

ORDNANCE SAFES.—Having mentioned in THE BUILDER the successful competitor for eight iron safes required by the Board of Ordnance, we have been asked by Messrs. Chubb and Son, in justice to them, to state that they were applied to by the office to furnish a pattern safe and a specification for the guidance of the competitors, and did so to the entire satisfaction of the Board, who adopted both.

## Miscellaneous.

RAILWAY COMPENSATION CASE AT BURSLEM.—Mr. Joseph Brindley, plaintiff; North Staffordshire Railway Company, defendants: subject of dispute, 2,268 yards of land to be severed near Burslem station. Plaintiff's demand for land, severance, and forced sale, 1,400l.; company's offer, 500l. The case was tried at Burslem, before Mr. W. Harding, as coroner, and a jury. For the plaintiff, it was argued by Mr. Huddleston that the land was worth about 5s. per yard for building, or 600l. to 650l. in all, including consideration of 50 per cent. for forced sale; besides 800l. to 850l. for severance and level crossing, with consequential damages; and the evidence thereupon was that of Mr. Higginbottom, of Longton, surveyor; Mr. S. Saint, of Burslem, architect and surveyor; Mr. John Chesshire, of Birmingham, surveyor; Mr. Shaw, of Longton, general valuer; Mr. Lynam, of Stoke, architect and surveyor; and Mr. Ebenezer Robins, of Birmingham, surveyor. For the defendants, it was argued by Mr. Keary, that even in the heart of the town of Burslem building-land had stood in the market unsold for many years, some since 1815 and not yet all disposed of; and that the evidence on behalf of the plaintiff had been given on false assumptions and opinions, carrying with them great contradictions. The evidence of Mr. George Harding, of Ternhill, land-surveyor, Mr. Ward, of Hanley, architect and surveyor, Mr. W. E. Twigg, of Burslem, solicitor, Mr. Ford, of Burslem, builder and valuer, Mr. John Leech, of Leek, land-valuer, Mr. B. Bond, of Draycott, agent and land valuer, Mr. Edward Wilmot, of Congleton, land-agent, &c., Mr. Charles Tribshaw, of Newcastle, architect and surveyor, and others, was then taken for the defendants, and estimated the value at from about 240l. up to 310l., and the damages at from about 30l. up to 170l. The jury found a verdict of 500l. for the land, and 300l. for damages, in all 800l.

THE PUBLICATION OF ELECTRO-TELEGRAPHIC NEWS.—The Electric Telegraph Company have a reading-room at Liverpool, the subscribers to which have the privilege of benefiting exclusively by the news received by telegraphic dispatch. The Exchange merchants may or may not be members of this institution; but their superintendent, at all events, has been a member, and as such—by order of the Exchange Committee he alleges—has been in the habit of taking wholesale advantage of the early intelligence, by publishing it forthwith in the Exchange. The Electric Telegraph Company, or the reading-room subscribers, or both, regarding the intelligence by telegraph as private property not to be published in this off-hand way, have voted the expulsion of the Exchange 'superintendent.' Do not squabbles such as this give rise to a question of still more serious import than that involving the right of private subscribers to make what use they please of intelligence they pay for,—namely, to the question whether such subscribers, of the private company who may thus compel them to become subscribers, ought to have the power of exclusive intelligence which may enable them to plunder their less fortunate non-subscribing or non-proprietary fellow-countrymen or townspeople leisurely and by wholesale, as well as otherwise yield omnipotent advantages with which the public at large can in no way cope?

COMPETITION: COLONNAGE FOR SWANSEA, SOUTH WALES.—We are informed that the building committee have selected three designs out of thirty-nine sets sent in, which they reported to the general committee to be so equal, that they could not come to any definite decision. Subsequently, the general committee (consisting of seventy-two gentlemen), have decided that Messrs. Fuller and Giggell's (Bristol) design is the first, Mr. R. H. Potter's (London) is the second, and Mr. Henry J. Hammon's (London) is the third.

THE COLUMNS OF THE ROBERT-STREET COLONNAGE are to be offered for sale by Messrs. Evershed and Horne on the 7th of November, and will afford a good opportunity to some who wish to make a show, architecturally, at small cost. We grieve over the alteration.